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ABSTRACT

The use of critical thinking and collaborative learning enhances the research process by establishing a disciplined yet supportive research and publication procedure. In addition, these methods provide common assumptions about the validity and reliability of research findings, while encouraging diverse points of view. Critical thinking helps students weigh evidence in determining its use in research; use logical and systematic thinking in developing a question at issue and answering it; explore connections between assumptions, points of view, and concepts; and develop criteria for assessing results. Collaborative learning provides a supportive environment for students to conduct research; offers a mediating audience for drafting and composing texts; improves the quality and quantity of thinking through continuous effort and feedback; and develops social skills in analysis, judgment, and criticism. Following a sequence of critical thinking exercises and writing activities, students in a college writing class were provided detailed guidelines for research projects summarizing critical thinking principles, describing the traditional term paper, and explaining the role of critical thinking in the research process. As a result, students were able to transform the term paper into a collaborative research project. Critical thinking and the research process itself became more intuitive and students learned that thinking can be both reflective and collaborative, moving them toward the ideal of critical inquiry. The class guidelines are included. Contains 11 references. (Author/BCY)

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Critical Thinking: A Model for Collaborative Research

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Abstract

Critical thinking and collaborative learning together enhance the research process by bringing about a disciplined yet supportive research and publication procedure, and by providing common assumptions about the validity and reliability of research findings while encouraging diverse points of view.

Critical thinking brings to the research process the following tools: (1) weighing evidentiary support in determining its use in research; (2) using logical and systematic thinking in developing a question at issue and answering it; (3) exploring connections between assumptions, points of view, and concepts; and (4) developing criteria for assessing results.

Collaborative learning advances the research process in the following ways: (1) providing a supportive environment for students to conduct research; (2) offering a mediating audience for drafting, composing, and negotiating the written text; (3) improving the quality and quantity of thinking through continuous effort and feedback; and (4) developing social skills in analysis, judgment, and criticism.

Following a sequence of critical thinking exercises and writing activities, students in a college writing class were provided detailed guidelines for their research project. These guidelines summarized critical thinking principles, described the traditional term paper, and explained how critical thinking should guide and inform the research procedure. Guidance was also provided in matters of publication format, collaborative group work, and evaluation of the completed project.

Using critical thinking methodology in tandem with collaborative learning, students were able to transform the term paper into a collaborative research project. With

practice, critical thinking—along with the research process itself—became more intuitive. Students learned that thinking can be both reflective and collaborative, moving them toward the ideal of critical inquiry.

Background: The Undergraduate Research Paper

At Black Hills State University, English 102 (Written Communication 2), has as its primary goal the teaching of the research paper. Typically, students are expected to write a 1500 word term paper using either the Modern Language Association (MLA) or the American Psychological Association (APA) format. English 102 students are expected to gather information from a variety of sources, local and global, print and electronic. The Little, Brown Handbook summarizes the research writing process: evaluating and synthesizing sources; taking notes using summary, paraphrase, and direct quotation; and developing a thesis sentence. Creating a structure around the thesis statement, the student is expected to produce an integrated, cohesive research paper (Fowler and Aaron, 1995, pp. 551-552).

Unfortunately, it has been more often the writing instructor's experience to read term papers which appear more like mere collections of information rather than organized discoveries leading to a central argument. All too often, these papers read like a series of quotations or close paraphrases, strung together from a few sources, reflecting the view of their authors, rather than the thoughtful analysis of the student writer. Students, when asked, will distinguish between an "informative" term paper and an "opinion" essay. The former is generally regarded as a skillful compilation with little intrusion from the student, while the latter invites speculation and opinion with little regard for logic or evidence. It is little wonder that university faculty question whether undergraduate students are capable of the higher levels of reasoning—analysis, synthesis, and judgment.

Before students can engage in higher reasoning, they must first read and assimilate source materials, with increasing degrees of knowledge and comprehension as they become more familiar with the research literature. Gradually, students learn to work with the body of information more intuitively, until they can operate at the level of what Richard Paul calls "single system" reasoning. Questions are asked for which there is one and only one possible correct answer (Paul, 1995b, p.56). Single system reasoning is prerequisite to higher level reasoning, since reading comprehension and understanding of texts is the very basis of forming judgments and assessments in a multi-system reasoning environment.

In their general education courses, freshman and sophomore students are more than likely to be taking large lecture classes in which the primary mode of pedagogy is didactic. In didactic instruction, the instructor is the interpreter and dispenser of information from the textbook, delivered primarily through lecture. The student is usually expected to "parrot" this material—often in a multiple choice test—in the same form it was delivered, without processing it (Paul, 1995a, p. 4). In this mode, the student's mind frequently disengages, retreating to rote memorization of the lecture notes. "Content" is reduced to lists remembered through simple acronyms.

Viewed in the context of general education courses delivered didactically, the writing instructor's task resembles that of Sisyphus pushing that heavy rock up a hopeless hill (Camus, 1955). The instructor is asking college freshmen and sophomores to transcend their environment of packaged information provided from "received" texts, and to begin to evaluate data critically. Where students are used to accepting authority uncritically, they are now asked to suspend their customary attitude, and simultaneously

assimilate and assess the texts they are reading. For these students, we can legitimately wonder how critical thinking can enter into the research process. Instructors who insist upon thinking in their students often face a wall of indifference and sometimes resistance. The research project is viewed by many undergraduates as a task involving compilation and manipulation of authoritative texts, rather than an exploration of ideas taking the student beyond the secure realm of lists, formulas and lecture notes. While critical thinking may be regarded as the answer to mindless text arrangement, any attempt to infuse critical thinking into the research process, if it is to succeed, must first find a way to re-establish the connection between thinking and content.

Critical Thinking

Perhaps the most comprehensive and systematic study of critical thinking has been conducted by Richard Paul (1995b). Critical thinking is defined as:

> A unique kind of purposeful thinking in which the thinker systematically and habitually imposed criteria and intellectual standards upon the thinking, taking charge of the construction of thinking, guiding the construction of thinking according to the standards, assessing the effectiveness of the thinking according to the purpose, the criteria, and the standards (p. 21).

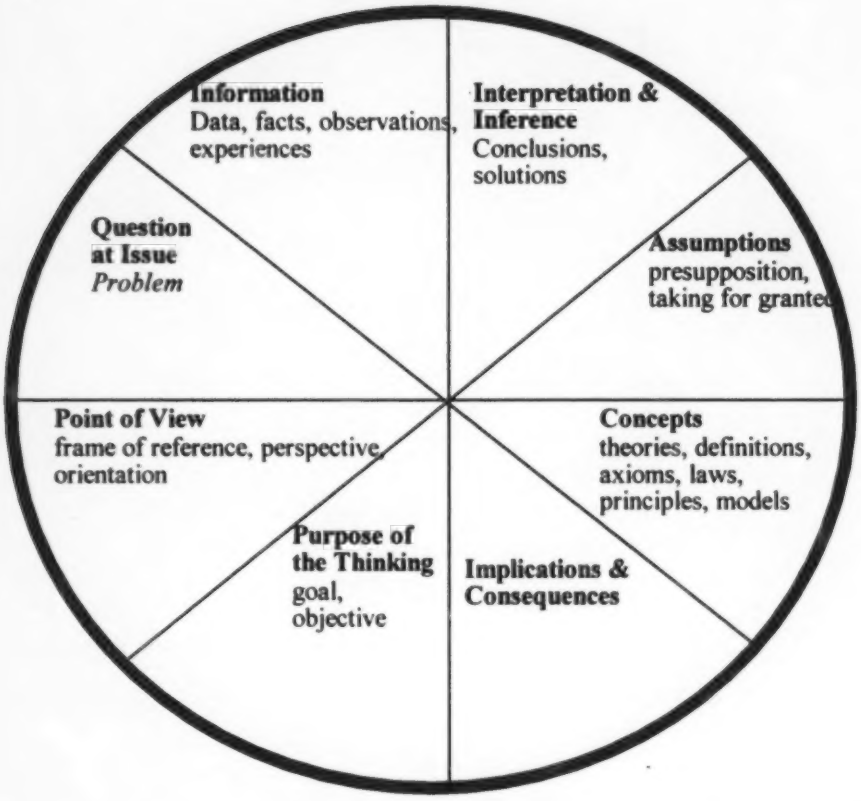
Paul argues that critical thinking requires fitness of the mind akin to physical fitness for the body. Traits of critical thinkers include intellectual integrity, intellectual humility, fairmindedness, intellectual empathy, and intellectual courage. Critical thinkers also continually assess the process, adjusting, adapting, and improving it. Finally, critical thinkers deliberately evaluate their thinking to determines its strengths and limitations, according to the purpose and criteria and standards, studying the implications for further thinking and improvement (p. 21).

The basic idea behind critical thinking is that learning must be active. To create new meanings, to understand new experiences, to solve new problems, one must actively and intellectually participate in the "figuring out" process. To learn is to reason, and to learn well one must reason well. Critical thinking assumes active engagement, from give and take, from disciplined reading, writing, speaking, or listening. It takes thinking apart in order to understand how it works, and at the same time assesses its own effectiveness (Paul, 1995a, pp. 5-6).

Critical thinking can be a powerful tool for engaging students in the research writing process. While students are engaged in deciding upon topics for their research papers, they are introduced to the primary critical thinking tools: the Questions, Elements, and Standards of Reasoning. Questions are of three types: information (single system), opinion (no system), and judgment (multi-system). Elements of Reasoning are: question at issue, information or data, point of view, assumptions, systems or theories, inferences and consequences, purpose, and conclusions. Standards include: relevance, precision, accuracy, clarity, breadth, depth, and logicalness (Figure 1). Together, the Questions, Elements, and Standards are interrelated and form a dynamic reasoning process that with practice becomes intuitive. Applying these systems to each phase of the research procedure—converting the thesis sentence to a Question at Issue (problem)—transforms the term paper project into a search for truth using the power of reasoning. As long as questioning is taking place, so does thinking.

Figure 1

THE ELEMENTS OF REASONING



WITH SENSITIVITY TO UNIVERSAL INTELLECTUAL STANDARDS

Clear	**Accurate**	**Deep**	**Breadth**
	Precise		
	Relevant		

Source: The Foundation for Critical Thinking, Santa Rosa, CA

Collaborative Learning

Collaborative learning assumes that students will learn more effectively working together than working independently (Bruffee, 1993, pp. 16-18). Collaborative learning theory owes its postmodern origin to the work of the Russian psychologist L. S. Vygotsky. In his "zone of proximal development," Vygotsky postulated a window of learning opportunity through which learners are pulled through in collaboration with more capable peers:

> The zone of proximal development is the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers.
>
> Learning creates the zone of proximal development; that is, learning awakens a variety of internal developmental processes that are able to operate only when the [student] is interacting with people in his environment and in cooperation with his peers. Once the processes are internalized, they become part of the [student's] independent developmental achievement (Vygotsky, 1978, p. 86).

Vygotsky's "zone of proximal development" led to the idea of collaborative learning, which regards the learning process as negotiated conversation between learners in a discourse community. Bruffee (1993) observes:

> The range, complexity and subtlety of our thought, its power, the practical and conceptual uses we can put it to, and the very issues we can address result from the degree to which we have been initiated into the craft of interdependence within the knowledge communities we belong to. . . . If college and university students are to become members of sophisticated, complex, highly literate communities, they can best reach that goal by experiencing something like that community membership in class—through collaborative learning (pp. 114-115).

Through collaborative learning, writing and learning converge at the site of the text, which develops as a social construct (Brufee, 1986). Working together, students negotiate their differences in order to arrive at meaning. "Consensus," argues Trimbur,

"can be a powerful instrument for students to generate differences, to identify the systems of authority that organize these differences, and to transform the relations of power that determine who may speak and what counts as a meaningful statement" (1989, p. 603). Consensus, rather than resulting in mediocre compromise, can lead to better thinking on the part of all members of the group. The group also provides a significant role in emotional support, which together with the psychological power of peer influence can move under-motivated and less capable peers to conform with higher group norms (Gebhardt, 1980, pp. 69-71). Writing collaboratively, students find that receiving feedback at all stages of the composing process leads to a far richer and thoughtful narrative than waiting until the later stages (p. 71).

Critical Thinking and Collaborative Learning

Critical thinking and collaborative learning together enhance the research process by bringing about a disciplined yet supportive research and publication procedure, and by providing common assumptions about the validity and reliability of research findings, yet encouraging diversity of points of view. For the student, critical thinking is prescriptive in origin yet dynamic in outcome. Collaborative learning involves negotiated conversations in the learning context, resulting in higher levels of knowledge.

Critical thinking brings to the research process the following tools: (1) weighing evidentiary support in determining its use in research; (2) using logical and systematic thinking in developing a question at issue and answering it; (3) exploring connections between assumptions, points of view, and concepts; and (4) developing criteria for assessing results.

Collaborative learning advances the research process in the following ways: (1) providing a supportive environment for students to conduct research; (2) offering a mediating audience for drafting, composing, and negotiating the written text; (3) improving the quality and quantity of thinking through continuous effort and feedback; and (4) developing social skills in analysis, judgment, and criticism.

The Collaborative Research Project

Following a sequence of critical thinking exercises and writing activities, students were provided detailed guidelines for their research project (Table 1). These guidelines summarized critical thinking principles, described the traditional term paper, and explained how critical thinking should guide and inform the research procedure. Guidance was also provided in matters of publication format, collaborative group work, and evaluation of the completed project.

Table 1

Collaborative Research Project
Guidelines

Critical Thinking: The collaborative research project is based on the critical thinking model. Critical thinking is a disciplined process of seeking truth. As such it involves abilities such as identifying assumptions, discerning implications, and understanding consequences of any choice or course of action taken. It involves intellectual standards such as clarity, depth, precision, and integrity.

This view of critical thinking builds on the work of Richard Paul, Robert Davis, and Vincent Ruggerio. The basic assumptions behind their approach are: (1) critical thinking is systematic and disciplined; (2) critical thinking begins with questions, which can be categorized into three types: Category 1, where there is one and only one correct answer; Category 2, where the answer is one of preference or "mere opinion"; and Category 3, where there are better or worse answers depending on the logic and evidence provided in support of the answers. (3) Critical thinking operates most profoundly within Category 3 level questioning and answering; and (4) critical thinking can be applied to any area of human learning.

Term Papers: You have most likely written a term paper for high school and college courses, in which you were asked to assemble a variety of sources pertaining to your research topic. Depending upon the instructor, you then used either the MLA (Modern Language Association) or APA (American Psychological Association) format in producing your paper. Most term papers emphasize the correct and appropriate use of sources and tend to be informational in nature. More controversial positions, if taken, usually borrow from the sources than originate from the student. As a result, many term papers present themselves as a mere compilation of sources rather than a critical inquiry into the subject.

Furthermore, the typical student research paper relies almost entirely on secondary sources, in which the primary or original research work has been done by others. The "authority" of the student writer, therefore, is wholly dependent upon the thinking of the "expert" researchers or authors whose work is being cited. If the student writer has not sorted out all the conflicting voices of his or her sources, the result can be a "Tower of Babel"—a confusing mixture of voices with no controlling point of view.

Research Writing and Critical Thinking: At this point we need a tool that will enable us to harness all these conflicting voices—all sounding authoritative—into a coherent whole, under your control and direction. Critical thinking can provide such a tool. Using the elements (wheel), standards, domains, and questions, you can figure out what you want to say and how to say it. One of the most important elements is the Question at Issue: What is the main point of my project? As you cull through your sources, both primary and secondary, you will shape and reshape your question. This will determine the central focus of your study, and at the same time will assert your position within your collaborative group.

Critical thinking does not replace the need for careful research; rather, it clarifies and enhances the research process. Critical thinking rejects sloppy, shallow documentation. It insists on depth, accuracy, precision in the interpretation of data as well as the selection of sources. Critical thinking rejects the insertion of personal opinion. Instead, it requires a coherent line of reasoning based on convincing evidence. Critical thinking really defines the essence of research.

Your Assignment: Your group will conduct a research project with an emphasis on contemporary issues. Each member of your group will investigate a particular part of the issue and write an individual essay based on a critical perspective. These papers will become chapters in a book edited by the group, with a title page, table of contents, introduction, chapters, and bibliography. For example, a group might write a book about Deadwood gambling, with separate chapters on topics such as the economic impact on the community, gambling addition, "gaming" vs. "Gambling," the story of one casino, the labor perspective, etc. Once each group member has completed his or her essay, it is mandatory that every group member read every other essay, to assure continuity of the investigation and to identify opportunities for better thinking. Consider how each

individual critical thinking "wheel" functions in relation to the other "wheels" as well as the larger "wheel" representing the whole project.

Format: All documents will be laser printed in a compatible and consistent format on 8½ by 11" quality white paper. Bindings may be three-ring, spiral bound, or other standard methods. Margins will be one inch on the top and bottom of each page, with 1½" left margin and 1" right margin. Title pages, contents, tables, illustrations, and bibliographies will follow consistently APA or MLA format (see Little, Brown Handbook). For examples of various formats, see the library of collaborative research projects in my office.

Hints for Success: I have found collaborative research can be the most rewarding—and sometimes the most frustrating—way to learn about a subject. Success depends on cooperation. Each member has his or her special strengths, and the wise group exploits these strengths. Some of the trouble spots are: incompatible computer formats, inadequate printers, illness of a key member, slow response from sources, and group member dissension. In spite of all these potential problems, I believe collaborative projects can produce a higher quality learning opportunity. For this reason they are being stressed in this course.

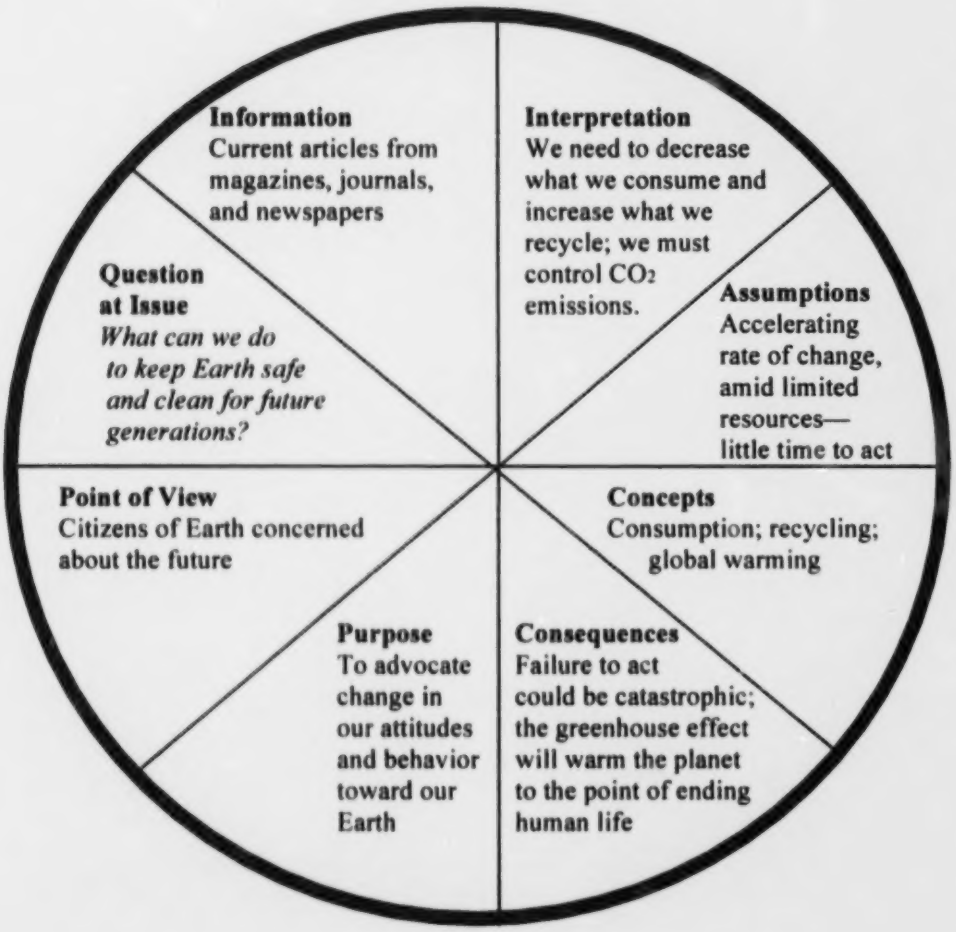
Evaluation: Although each step of the collaborative research process will be taken into account, the evaluation of the project will emphasize the final product: the book or report. Grades will be assigned individually, with approximately 20 percent of the grade reflecting your contribution to the group. A project, for example, with an outstanding introduction, excellent essays, but with one or two essays not of the caliber of the rest, would not create problems for those with excellent work. In any event, I will look at each project holistically and meet with each group member individually as part of the assessment.

Your research paper will be evaluated as follows: The assignment was designed to assess your critical thinking problem solving, and collaboration/communication skills. Within each of the elements of reasoning, your response was evaluated for its clarity, relevance, coherence, logic, depth, consistency, and fairness.
Evaluative grid: weak / fair / good / strong
Question well stated? Clear and unbiased? Show complexity?
Cites relevant evidence, etc.?
Clarifies key concepts when necessary?
Sensitive to assumptions?
Develops line of reasoning, with explanations?
Reasoning well supported?
Shows sensitivity to alternative points of view?
Shows sensitivity to implications and consequences of position taken?
Overall (80% of score):
Contribution to group (20% of score):
Total project score:

A Sample Student Research Project

Five English 102 students designed a collaborative research project, "Our Earth, Our Responsibility, Our Consequences." The Question at Issue for the project was: "What can we do to keep Earth safe and clean for future generations?" Using the Collaborative Research Project Guidelines (Table 1), the student authors constructed a "wheel" representing the Elements of Reasoning for the project as a whole (Figure 2).

Figure 2


Information
Current articles from magazines, journals, and newspapers
Interpretation
We need to decrease what we consume and increase what we recycle; we must control CO_2 emissions.
Question at Issue
What can we do to keep Earth safe and clean for future generations?
Assumptions
Accelerating rate of change, amid limited resources—little time to act
Point of View
Citizens of Earth concerned about the future
Concepts
Consumption; recycling; global warming
Purpose
To advocate change in our attitudes and behavior toward our Earth
Consequences
Failure to act could be catastrophic; the greenhouse effect will warm the planet to the point of ending human life

The students then designed individual "wheels" for their sub-projects, using the eight Elements of Reasoning. The three sub-questions, all placed in their respective wheels, were: (1) How is the Earth affected by our consumption of natural resources? (2) What are the social and economic benefits of recycling? (3) What can we do to stop the depletion of the ozone layer? Each question in turn generated consequences, assumptions, purpose, point of view, interpretation, information, concepts, and consequences.

Using this strategy, collaborating together through designing each other's wheel, then reasoning inductively to design the overall wheel, and finally checking to see how each wheel fit within the total design, the students were able to envision the project as a whole and at the same time see their individual contributions in a new light. This conversation resulted in a collaborative reasoning process that "figured things out"—testing and adjusting ideas against assumptions, observations, past observations, beliefs, and experiences. Actively engaged in reasoning collaboratively and individually, the students began to regard research as an ongoing pursuit of truth.

Collaborative research projects could also be organized around other critical thinking configurations. Domains—psychological, economic, educational, historical, biological—could comprise the logic of each individual study within the collaborative project, or the entire project could work within a single domain. Within the educational domain, a biological study could be conducted on the effects of global warming . Another study could be done on the economic impact of recycling. In similar fashion, the Questions could be used to guide and integrate a collaborative research project. Figure 3 shows four ways to generate questions, using structures, systems, standards, and domains.

Figure 3

Four Ways to Generate Questions

Using your knowledge of structure of thought & logic of systems	Using your knowledge of systems	Using your knowledge of standards	Using your knowledge of disciplines & domains
To focus on questions based on the elements of thought: Purpose Question at issue Concepts Assumptions Information Interpretations Implications Point of view	To focus on 3 types of questions: *Questions with one right answer* (One system) *Questions that are a matter of subjective preference* (No system) *Questions with better and worse answers* (Competing systems)	To focus on questions based on standards: Clarity Accuracy Precision Relevance Depth Breadth Logicalness	To focus on questions specific to a discipline or domain: Scientific questions Mathematical questions Historical questions Literary questions etc.

Source: The Foundation for Critical Thinking, Santa Rosa, CA

Conclusion

Using critical thinking methodology in tandem with collaborative learning, students were able to transform the term paper into a collaborative research project. Infused with critical thinking, the collaborative learning process resulted in a supportive yet disciplined research and publication procedure. Within the dynamics of group work, critical thinking encouraged diversity of points of view, yet provided a common assumption about the validity and reliability of research findings. Critical thinking, assisted by collaborative learning, provided students three essential research tools: (1) weighing evidentiary support in determining its relevance; (2) employing logical and systematic thinking in developing questions at issue and other elements of reasoning; and (3) developing criteria for assessing results. With practice, critical thinking—along with the research process itself—becomes more intuitive. Students learn that thinking can be both independent and collaborative, moving them toward the ideal of critical inquiry. Indeed, 2 + 2 = 5.

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